

PATENT COOPERATION TREATY

From the INTERNATIONAL SEARCHING AUTHORITY

PCT

NOTIFICATION OF TRANSMITTAL OF
THE INTERNATIONAL SEARCH REPORT AND
THE WRITTEN OPINION OF THE INTERNATIONAL
SEARCHING AUTHORITY, OR THE DECLARATION

To:

MAIWALD PATENTANWALTS GMBH

Attn. Huenges, Martin

Elisenhof

Elisenstrasse 3

80335 München

GERMANY

MAIWALD
Patentanwälte GmbH

18. April 2005

MÜNCHEN

POST 18.06.05 not is

A 19

(PCT Rule 44.1)

Date of mailing
(day/month/year)

18/04/2005

Applicant's or agent's file reference

N 7195/KK

FOR FURTHER ACTION

See paragraphs 1 and 4 below

International application No.

PCT/EP2004/014796

International filing date
(day/month/year)

29/12/2004

Applicant

NCTENGINEERING GMBH

1. ☒ The applicant is hereby notified that the international search report and the written opinion of the International Searching Authority have been established and are transmitted herewith.

Filing of amendments and statement under Article 19:

The applicant is entitled, if he so wishes, to amend the claims of the International Application (see Rule 46):

When? The time limit for filing such amendments is normally 2 months from the date of transmittal of the International Search Report; however, for more details, see the notes on the accompanying sheet.

Where? Directly to the International Bureau of WIPO, 34 chemin des Colombettes
1211 Geneva 20, Switzerland, Facsimile No.: (41-22) 740.14.35

For more detailed instructions, see the notes on the accompanying sheet.

2. ☐ The applicant is hereby notified that no International search report will be established and that the declaration under Article 17(2)(a) to that effect and the written opinion of the International Searching Authority are transmitted herewith.
3. ☐ With regard to the protest against payment of (an) additional fee(s) under Rule 40.2, the applicant is notified that:

- ☐ the protest together with the decision thereon has been transmitted to the International Bureau together with the applicant's request to forward the texts of both the protest and the decision thereon to the designated Offices.
- ☐ no decision has been made yet on the protest; the applicant will be notified as soon as a decision is made.

4. Reminders

Shortly after the expiration of 18 months from the priority date, the international application will be published by the International Bureau. If the applicant wishes to avoid or postpone publication, a notice of withdrawal of the international application, or of the priority claim, must reach the International Bureau as provided in Rules 90bis.1 and 90bis.3, respectively, before the completion of the technical preparations for international publication.

The applicant may submit comments on an informal basis on the written opinion of the International Searching Authority to the International Bureau. The International Bureau will send a copy of such comments to all designated Offices unless an international preliminary examination report has been or is to be established. These comments would also be made available to the public but not before the expiration of 30 months from the priority date.

Within 19 months from the priority date, but only in respect of some designated Offices, a demand for international preliminary examination must be filed if the applicant wishes to postpone the entry into the national phase until 30 months from the priority date (in some Offices even later); otherwise, the applicant must, within 20 months from the priority date, perform the prescribed acts for entry into the national phase before those designated Offices.

In respect of other designated Offices, the time limit of 30 months (or later) will apply even if no demand is filed within 19 months.

See the Annex to Form PCT/IB/301 and, for details about the applicable time limits, Office by Office, see the *PCT Applicant's Guide*, Volume II, National Chapters and the WIPO Internet site.

Name and mailing address of the International Searching Authority

 European Patent Office, P.B. 5818 Patentlaan 2
NL-2280 HV Rijswijk
Tel. (+31-70) 340-2040, Tx. 31 651 epo nl,
Fax: (+31-70) 340-3016

Authorized officer

Cora Dreyer

NOTES TO FORM PCT/ISA/220

These Notes are intended to give the basic instructions concerning the filing of amendments under article 19. The Notes are based on the requirements of the Patent Cooperation Treaty, the Regulations and the Administrative Instructions under that Treaty. In case of discrepancy between these Notes and those requirements, the latter are applicable. For more detailed information, see also the PCT Applicant's Guide, a publication of WIPO.

In these Notes, "Article", "Rule", and "Section" refer to the provisions of the PCT, the PCT Regulations and the PCT Administrative Instructions respectively.

INSTRUCTIONS CONCERNING AMENDMENTS UNDER ARTICLE 19

The applicant has, after having received the international search report, one opportunity to amend the claims of the international application. It should however be emphasized that, since all parts of the international application (claims, description and drawings) may be amended during the international preliminary examination procedure, there is usually no need to file amendments of the claims under Article 19 except where, e.g. the applicant wants the latter to be published for the purposes of provisional protection or has another reason for amending the claims before international publication. Furthermore, it should be emphasized that provisional protection is available in some States only.

What parts of the international application may be amended?

Under Article 19, only the claims may be amended.

During the international phase, the claims may also be amended (or further amended) under Article 34 before the International Preliminary Examining Authority. The description and drawings may only be amended under Article 34 before the International Examining Authority.

Upon entry into the national phase, all parts of the international application may be amended under Article 28 or, where applicable, Article 41.

When?

Within 2 months from the date of transmittal of the international search report or 16 months from the priority date, whichever time limit expires later. It should be noted, however, that the amendments will be considered as having been received on time if they are received by the International Bureau after the expiration of the applicable time limit but before the completion of the technical preparations for international publication (Rule 46.1).

Where not to file the amendments?

The amendments may only be filed with the International Bureau and not with the receiving Office or the International Searching Authority (Rule 46.2).

Where a demand for international preliminary examination has been/is filed, see below.

How?

Either by cancelling one or more entire claims, by adding one or more new claims or by amending the text of one or more of the claims as filed.

A replacement sheet must be submitted for each sheet of the claims which, on account of an amendment or amendments, differs from the sheet originally filed.

All the claims appearing on a replacement sheet must be numbered in Arabic numerals. Where a claim is cancelled, no renumbering of the other claims is required. In all cases where claims are renumbered, they must be renumbered consecutively (Administrative Instructions, Section 205(b)).

The amendments must be made in the language in which the international application is to be published.

What documents must/may accompany the amendments?

Letter (Section 205(b)):

The amendments must be submitted with a letter.

The letter will not be published with the international application and the amended claims. It should not be confused with the "Statement under Article 19(1)" (see below, under "Statement under Article 19(1)").

The letter must be in English or French, at the choice of the applicant. However, if the language of the international application is English, the letter must be in English; if the language of the international application is French, the letter must be in French.

NOTES TO FORM PCT/ISA/220 (continued)

The letter must indicate the differences between the claims as filed and the claims as amended. It must, in particular, indicate, in connection with each claim appearing in the international application (it being understood that identical indications concerning several claims may be grouped), whether

- (i) the claim is unchanged;
- (ii) the claim is cancelled;
- (iii) the claim is new;
- (iv) the claim replaces one or more claims as filed;
- (v) the claim is the result of the division of a claim as filed.

The following examples illustrate the manner in which amendments must be explained in the accompanying letter:

1. [Where originally there were 48 claims and after amendment of some claims there are 51]:
"Claims 1 to 29, 31, 32, 34, 35, 37 to 48 replaced by amended claims bearing the same numbers; claims 30, 33 and 36 unchanged; new claims 49 to 51 added."
2. [Where originally there were 15 claims and after amendment of all claims there are 11]:
"Claims 1 to 15 replaced by amended claims 1 to 11."
3. [Where originally there were 14 claims and the amendments consist in cancelling some claims and in adding new claims]:
"Claims 1 to 6 and 14 unchanged; claims 7 to 13 cancelled; new claims 15, 16 and 17 added." or
"Claims 7 to 13 cancelled; new claims 15, 16 and 17 added; all other claims unchanged."
4. [Where various kinds of amendments are made]:
"Claims 1-10 unchanged; claims 11 to 13, 18 and 19 cancelled; claims 14, 15 and 16 replaced by amended claim 14; claim 17 subdivided into amended claims 15, 16 and 17; new claims 20 and 21 added."

"Statement under article 19(1)" (Rule 46.4)

The amendments may be accompanied by a statement explaining the amendments and indicating any impact that such amendments might have on the description and the drawings (which cannot be amended under Article 19(1)).

The statement will be published with the international application and the amended claims.

It must be in the language in which the international application is to be published.

It must be brief, not exceeding 500 words if in English or if translated into English.

It should not be confused with and does not replace the letter indicating the differences between the claims as filed and as amended. It must be filed on a separate sheet and must be identified as such by a heading, preferably by using the words "Statement under Article 19(1)."

It may not contain any disparaging comments on the international search report or the relevance of citations contained in that report. Reference to citations, relevant to a given claim, contained in the international search report may be made only in connection with an amendment of that claim.

Consequence if a demand for international preliminary examination has already been filed

If, at the time of filing any amendments under Article 19, a demand for international preliminary examination has already been submitted, the applicant must preferably, at the same time of filing the amendments with the International Bureau, also file a copy of such amendments with the International Preliminary Examining Authority (see Rule 62.2(a), first sentence).

Consequence with regard to translation of the international application for entry into the national phase

The applicant's attention is drawn to the fact that, where upon entry into the national phase, a translation of the claims as amended under Article 19 may have to be furnished to the designated/elected Offices, instead of, or in addition to, the translation of the claims as filed.

For further details on the requirements of each designated/elected Office, see Volume II of the PCT Applicant's Guide.

PATENT COOPERATION TREATY

PCT

INTERNATIONAL SEARCH REPORT

(PCT Article 18 and Rules 43 and 44)

Applicant's or agent's file reference N 7195/KK	FOR FURTHER ACTION see Form PCT/ISA/220 as well as, where applicable, item 5 below.	
International application No. PCT/EP2004/014796	International filing date (day/month/year) 29/12/2004	(Earliest) Priority Date (day/month/year) 30/12/2003
Applicant NCTENGINEERING GMBH		

This International Search Report has been prepared by this International Searching Authority and is transmitted to the applicant according to Article 18. A copy is being transmitted to the International Bureau.

This International Search Report consists of a total of 4 sheets.

☒ It is also accompanied by a copy of each prior art document cited in this report.

1. Basis of the report

- a. With regard to the language, the international search was carried out on the basis of the international application in the language in which it was filed, unless otherwise indicated under this item.

☐ The international search was carried out on the basis of a translation of the international application furnished to this Authority (Rule 23.1(b)).

- b. ☐ With regard to any nucleotide and/or amino acid sequence disclosed in the international application, see Box No. I.

2. ☐ Certain claims were found unsearchable (See Box II).

3. ☐ Unity of invention is lacking (see Box III).

4. With regard to the title,

☒ the text is approved as submitted by the applicant.

☐ the text has been established by this Authority to read as follows:

5. With regard to the abstract,

☒ the text is approved as submitted by the applicant.

☐ the text has been established, according to Rule 38.2(b), by this Authority as it appears in Box No. IV. The applicant may, within one month from the date of mailing of this international search report, submit comments to this Authority.

6. With regard to the drawings,

- a. the figure of the drawings to be published with the abstract is Figure No. 35

☒ as suggested by the applicant.

☐ as selected by this Authority, because the applicant failed to suggest a figure.

☐ as selected by this Authority, because this figure better characterizes the invention.

- b. ☐ none of the figures is to be published with the abstract.

INTERNATIONAL SEARCH REPORT

International Application No

PCT/EP2004/014796

A. CLASSIFICATION OF SUBJECT MATTER

IPC 7 G01L3/10 G01L1/12 G01L3/14 G01L25/00

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC 7 G01L

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the International search (name of data base and, where practical, search terms used)

EPO-Internal, WPI Data, PAJ

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
	-/--	



Further documents are listed in the continuation of box C.



Patent family members are listed in annex.

* Special categories of cited documents :

- *A* document defining the general state of the art which is not considered to be of particular relevance
- *E* earlier document but published on or after the international filing date
- *L* document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)
- *O* document referring to an oral disclosure, use, exhibition or other means
- *P* document published prior to the international filing date but later than the priority date claimed

- *T* later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention
- *X* document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone
- *Y* document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art.
- *8* document member of the same patent family

Date of the actual completion of the international search

6 April 2005

Date of mailing of the international search report

18/04/2005

Name and mailing address of the ISA

European Patent Office, P.B. 5818 Patentlaan 2
NL - 2280 HV Rijswijk
Tel. (+31-70) 340-2040, Tx. 31 651 epo nl.
Fax: (+31-70) 340-3016

Authorized officer

Helm, B

PATENT COOPERATION TREATY

From the
INTERNATIONAL SEARCHING AUTHORITY

PCT

To:

see form PCT/ISA/220 **MAINTAINED**
19. April 2005
NOT IN VEN
EXIST 30.10.05 not is
Stellungnahme

WRITTEN OPINION OF THE INTERNATIONAL SEARCHING AUTHORITY (PCT Rule 43bis.1)

Date of mailing
(day/month/year) see form PCT/ISA/210 (second sheet)

Applicant's or agent's file reference
see form PCT/ISA/220

FOR FURTHER ACTION
See paragraph 2 below

International application No.
PCT/EP2004/014796

International filing date (day/month/year)
29.12.2004

Priority date (day/month/year)
30.12.2003

International Patent Classification (IPC) or both national classification and IPC
G01L3/10, G01L1/12, G01L3/14, G01L25/00

Applicant
NCTENGINEERING GMBH

1. This opinion contains indications relating to the following items:

- ☒ Box No. I Basis of the opinion
- ☐ Box No. II Priority
- ☐ Box No. III Non-establishment of opinion with regard to novelty, inventive step and industrial applicability
- ☐ Box No. IV Lack of unity of invention
- ☒ Box No. V Reasoned statement under Rule 43bis.1(a)(i) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement
- ☐ Box No. VI Certain documents cited
- ☐ Box No. VII Certain defects in the international application
- ☐ Box No. VIII Certain observations on the international application

2. FURTHER ACTION

If a demand for international preliminary examination is made, this opinion will usually be considered to be a written opinion of the International Preliminary Examining Authority ("IPEA"). However, this does not apply where the applicant chooses an Authority other than this one to be the IPEA and the chosen IPEA has notified the International Bureau under Rule 66.1bis(b) that written opinions of this International Searching Authority will not be so considered.

If this opinion is, as provided above, considered to be a written opinion of the IPEA, the applicant is invited to submit to the IPEA a written reply together, where appropriate, with amendments, before the expiration of three months from the date of mailing of Form PCT/ISA/220 or before the expiration of 22 months from the priority date, whichever expires later.

For further options, see Form PCT/ISA/220.

3. For further details, see notes to Form PCT/ISA/220.

Name and mailing address of the ISA:



European Patent Office
D-80298 Munich
Tel. +49 89 2399 - 0 Tx: 523656 epmu d
Fax: +49 89 2399 - 4465

Authorized Officer

Helm, B

Telephone No. +49 89 2399-2366



**WRITTEN OPINION OF THE
INTERNATIONAL SEARCHING AUTHORITY**

International application No.
PCT/EP2004/014796

Box No. I Basis of the opinion

1. With regard to the **language**, this opinion has been established on the basis of the international application in the language in which it was filed, unless otherwise indicated under this item.
 - ☐ This opinion has been established on the basis of a translation from the original language into the following language , which is the language of a translation furnished for the purposes of international search (under Rules 12.3 and 23.1(b)).
2. With regard to any **nucleotide and/or amino acid sequence** disclosed in the international application and necessary to the claimed invention, this opinion has been established on the basis of:
 - a. type of material:
 - ☐ a sequence listing
 - ☐ table(s) related to the sequence listing
 - b. format of material:
 - ☐ in written format
 - ☐ in computer readable form
 - c. time of filing/furnishing:
 - ☐ contained in the international application as filed.
 - ☐ filed together with the international application in computer readable form.
 - ☐ furnished subsequently to this Authority for the purposes of search.
3. ☐ In addition, in the case that more than one version or copy of a sequence listing and/or table relating thereto has been filed or furnished, the required statements that the information in the subsequent or additional copies is identical to that in the application as filed or does not go beyond the application as filed, as appropriate, were furnished.
4. Additional comments:

**WRITTEN OPINION OF THE
INTERNATIONAL SEARCHING AUTHORITY**

International application No.
PCT/EP2004/014796

Box No. V Reasoned statement under Rule 43bis.1(a)(i) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement

1. Statement

Novelty (N)	Yes: Claims	2-4, 6, 9-19, 23-25, 27, 28, 32, 33, 36, 40-42, 44, 47-51, 53, 54, 56-59, 63, 65, 67
	No: Claims	1, 5, 7, 8, 20-22, 26, 29-31, 34, 35, 37-39, 43, 45, 46, 52, 55, 60-62, 64, 66
Inventive step (IS)	Yes: Claims	
	No: Claims	1-67
Industrial applicability (IA)	Yes: Claims	1-67
	No: Claims	

2. Citations and explanations

see separate sheet

INTERNATIONAL SEARCH REPORT

International Application No

PCT/EP2004/014796

C.(Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US 6 581 480 B1 (MAY LUTZ AXEL ET AL) 24 June 2003 (2003-06-24)	1,2,4,5, 7,8, 18-24, 26-31, 34,35, 37-40, 42,43, 45,46, 51-58, 60-66
Y	abstract; figures 5b,12a,12b column 4, line 20 - line 42 column 6, line 53 - line 67 column 8, line 26 - line 31 column 10, line 20 - line 36 column 11, line 9 - line 33 column 12, line 63 - column 13, line 8 column 13, line 57 - column 15, line 8 column 17, line 58 - line 61 -----	3,6, 9-17,25, 32,33, 36,41, 44, 47-50, 59,67
Y	WO 01/79801 A (FAST TECHNOLOGY AG; MAY, LUTZ, AXEL) 25 October 2001 (2001-10-25) abstract; figure 2b page 3, line 1 - line 10 page 11, line 17 - page 16, line 3 page 27, line 23 - page 29, line 3 -----	3,9-17, 41, 47-50, 59,67
Y	WO 00/57150 A (FAST TECHNOLOGY GMBH; MAY, LUTZ, AXEL; OWSLEY, JOHN) 28 September 2000 (2000-09-28) abstract; figures 10b,13 page 9, line 3 - line 20 page 19, line 4 - page 20, line 5 page 21, line 11 - line 14 page 22, line 20 - line 22 -----	6,25,32, 33,36,44

INTERNATIONAL SEARCH REPORT

Information on patent family members

International Application No

PCT/EP2004/014796

Patent document cited in search report		Publication date	Patent family member(s)	Publication date
US 6581480	B1	24-06-2003	AU 2739999 A EP 1070237 A1 WO 9956099 A1 JP 2002513147 T	16-11-1999 24-01-2001 04-11-1999 08-05-2002
WO 0179801	A	25-10-2001	AU 5832101 A WO 0179801 A2 EP 1282810 A2 JP 2003531368 T US 2003150282 A1	30-10-2001 25-10-2001 12-02-2003 21-10-2003 14-08-2003
WO 0057150	A	28-09-2000	AU 3442300 A EP 1169627 A1 WO 0057150 A1 JP 2002540392 T	09-10-2000 09-01-2002 28-09-2000 26-11-2002

Prior Art

Reference is made to the following documents:

- D1 = US-B1-6 581 480 (MAY LUTZ AXEL ET AL) 24 June 2003 (2003-06-24)
 D2 = WO 01/79801 A (FAST TECHNOLOGY AG; MAY, LUTZ, AXEL) 25 October 2001 (2001-10-25)
 D3 = WO 00/57150 A (FAST TECHNOLOGY GMBH; MAY, LUTZ, AXEL; OWSLEY, JOHN) 28 September 2000 (2000-09-28)

Re Item V.**1. Objections under Article 33(2) PCT (Novelty)**

1.1. The present application does not satisfy the criterion set forth in Article 33(2) PCT because the subject-matter of claims 1, 5, 7, 8, 20 to 22, 26, 29 to 31, 34, 35, 37 to 39, 43, 45, 46, 52, 55, 60 to 62, 64 and 66 is not new in respect of prior art as defined in the regulations (Rule 64(1)-(3) PCT).

1.2. Document D1 (see e.g. passages cited in the International Search Report) discloses an apparatus for and a method of measuring torque comprising a torque measuring shaft 10 made of steel (including Nickel ranging from 0.2% to about 18%, and optionally Cobalt) and rotatable about a longitudinal axis, said shaft comprising at least one magnetised zone disposed along its longitudinal axis.

In order to provide said magnetisation, shaft 10 is provided with a set of two ring electrodes 62 enclosing the shaft 10. To generate a circumferential magnetic field in the shaft 10, a direct current pulse 60 is passed longitudinally through the shaft 10. The current can be made to flow either through the whole shaft or through portions of it. In the latter case, the current 60 is applied through said ring electrodes 62 attached to the shaft. The direction of the generated magnetic field depends on the polarity of the current.

According to document D1, for long term stability of the magnetic field generated by the magnetised portion/s of the shaft, it is preferable to employ a magnetisation that forms a closed loop within the shaft's material. It is the nature of such a closed loop that it

always comprises opposite sections of magnetic flow in opposite directions, no matter whether a circumferential or a longitudinal magnetisation is generated in the shaft.

Moreover, shaft 150 (figs. 12a, 12b) disclosed in document D1 comprises multiple circumferential fields disposed axially along the shaft with guard fields to each side of an inner field to enhance the performance of the inner zone as a torque transducer element; cf fig. 12a showing a transducer field and two guard fields. A portion 152 of the shaft is subject to applied magnetic fields to create three next adjacent zones 154, 156 and 158 that are circumferentially magnetised as indicated by the arrows to have outer zones 154 and 158 of opposite polarity magnetisation to that of the inner zone 156.

Figure 12b of document D1 shows a case where sensing is done with the aid of two inner oppositely polarized, circumferential fields 156a, 156b which are to act as transducer fields. The fields emanated by the two zones 156a, 156b are sensed by respective sensor arrangements 160a, 160b enabling the transducer system to provide compensation for the effects of external magnetic fields, such as the earth's magnetic field. In Figure 12b the two outer guard ring fields 154 and 158 are now of opposite polarity so that each guard ring 154 and 158 is of opposite polarity to the inner transducer field 156a and 156b respectively to which it is next adjacent. Each of the inner transducer fields 156a and 156b is thus bounded by two fields of opposite polarity. Therefore, claims 1, 5, 7, 8, 20 to 22, 26, 29 to 31, 34, 35, 37 to 39, 43, 45, 46, 52, 55, 60 to 62, 64 and 66 are not novel.

2. Objections under Article 33(3) PCT (Inventive Step)

2.1. The present application does not satisfy the criterion set forth in Article 33(3) PCT because the subject-matter of claims 2 to 4, 6, 9 to 19, 23 to 25, 27, 28, 32, 33, 36, 40 to 42, 44, 47 to 51, 53, 54, 56 to 59, 63, 65 and 67 does not involve an inventive step (Rule 65(1),(2)) PCT.

2.2. Independent claim 58 differs from document D1 in that at least two current pulses are applied. However, it is immediately evident to the skilled person that more than one current pulse would have to be applied to the shaft in order to achieve an array of magnetised zones as it is shown in figure 12b of document D1 with a magnetisation arrangement as presented in the context of figure 5b of the same document.

Thus, the application of several current pulses with different polarities at different

locations of the shaft as it is encompassed by the scope of independent claim 58 does not involve an inventive step.

For the same reasons, dependent claims 2, 4, 18, 19, 24, 27, 28, 40, 42, 51, 54, 56, 57 and 63 are not inventive.

- 2.3. Further dependent claims 3, 6, 9 to 17, 23, 25, 32, 33, 36, 41, 44, 47 to 50, 53, 59, 65 and 67 only suggest slight changes to the arrangements of the independent claims to which they refer. These changes are regarded as being within the scope of the customary practice followed by persons skilled in the art, especially as the advantages thus achieved can be readily contemplated in advance.
- 2.4. In particular, document D2 (see e.g. passages cited in the International Search Report) suggests in an "Electromagnet Alternative" the application of a ramped signal having different raising and falling edges. The selection of appropriate raising and falling edges, however, as well as an appropriate timing, pulse amplitude and duration, is a matter of straightforward trial and error routine experiments from which the skilled person would select suitable values, in accordance with circumstances, without the exercise of inventive skill.
Thus, also claims 3, 9 to 17, 41, 47 to 50, 59 and 67 do not involve an inventive step.
- 2.5. Document D3 (see e.g. passages cited in the International Search Report) also describes a shaft, wherein a longitudinal magnetisation has in a radial direction of the shaft a surface adjacent annular magnetised zone 154 within which an interior annular magnetised zone 156 of opposite polarity is established. The two zones combine to provide a torus of closed loop magnetic flux. The magnetisation is obtained by a two-step procedure. Firstly a deep annular region of the polarity of zone 156 is formed by the magnet 150. Then the surface adjacent zone 154 is formed by reversing the magnetisation polarity of the surface adjacent region of the deep region. According to document D3 (page 21, lines 11 to 14), the principles given "above" (i.e. on pages 1 to 20 of document D1) can be applied to radially spaced circumferential magnetisations which find particular, though not exclusive, application in torque transmitting discs. Moreover, document D3 mentions that circumferential magnetisations can be achieved with a shaft being subjected to an axially directed current (see e.g. page 9, lines 3 to 20).

In order to create the concentric circumferential magnetisations as shown in figure 13 of document D3 in a shaft instead of a disc, the skilled person would also consider to subject the shaft to a plurality of axially directed current pulses of different polarities and waveforms.

In particular, said indication that "the principles given above can be applied to radially spaced circumferential magnetisations which find application also in other arrangements but discs", would prompt the skilled person to apply such an "above principle" as the application of axially directed currents in order to achieve radially spaced circumferential magnetisations in a shaft.

Therefore, claims 6, 25, 32, 33, 36 and 44 do not involve an inventive step.

- 2.6. The specific electrode design defined in claims 23, 53 and 65 is merely one of several straightforward possibilities from which the skilled person would select, in accordance with circumstances.

Hence, claims 23, 53 and 65 do not contribute to inventive step, either.

3. Articles 33(1),(4) PCT (Industrial Applicability)

Beyond any doubts, the subject-matter defined in claims 1 to 67 is industrially applicable, e.g. in commercially available torque sensors and their manufacturing.

4. Further Objections and Remarks

- 4.1. The variation in wording between independent claims 1, 29, 39, 58, 60, 62 and 64 leaves the single general inventive concept linking those claims - as required by Rule 13 PCT - unclear. In the Examiner's opinion it is not appropriate to have more than a single independent claim in each category (apparatus/method) in this application and the claims are therefore not acceptable under Article 6 PCT.

The claims should have been drafted to include only one independent claim in each category (apparatus/method) with dependent claims as appropriate (Rule 6.4(a)-(c) PCT).

- 4.2. The features in the apparatus claims 1 to 6, 8 to 19, 23, 24, 27, 28, 32, 53 ("The torque sensor of claim 52" although claim 52 relates to a method), 62, 64 and 67 relate to

method steps instructing how to use or manufacture the apparatus rather than clearly defining the apparatus in terms of its structural technical features. Due to this mixture of categories, the intended limitations are not clear from these claims, contrary to the requirements of Article 6 PCT. Method steps in apparatus claims should be avoided.

4.3. Claims 22, 23 and 65 provide definitions of features in relation to further unclaimed entities, thus introducing uncertainty about the claims' scope; Article 6 PCT:

- (i) claims 22, 23: the electrode system and electrodes appear not to form part of the claimed torque sensor;
- (ii) claim 65: the sensor element appears not to form part of the claimed electrode system.

4.4. Claims 24, 29, 54 and 58 are unclear since they define a "a direction essentially perpendicular to a surface of the sensor element" without introducing a specific shape of the sensor element. Therefore said "direction" introduces ambiguities and should have been closer specified; Article 6 PCT.

A corresponding objection applies to the "direction along a/the longitudinal axis" defined in claims 1, 2, 39 and 40.

4.5. The backreferences of claims 41 and 42 are inconsistent, since only claim 40 introduces a second current pulse.

4.6. Contrary to the requirements of Rule 5.1(a)(ii) PCT, the relevant background art disclosed in the **documents D1 to D3** is not mentioned in the description, nor are these documents identified therein.

4.7. The features of the claims are not provided with reference signs placed in parentheses (Rule 6.2(b) PCT).